Remarks

Reconsideration and allowance of the above-identified application, as currently amended, is respectfully requested.

Claims 1-49 remain pending of which claims 1, 2, 4, 8, 9, 11, 16, 26, 27, 29, 33, 34, 36 and 40 are concurrently amended. Editorial revisions were implemented the independent claims which more closely relates the same to the disclosed embodiments. In this regard, the expression "deriving a value for the derivative..." was amended to read as "deriving values for the derivative...." Consistent with this, also, the relating expression "said derivative value" was amended to the expression the derivative values. These changes were effected with regard to independent claims 1, 8, 26, and 33. Consistent with this, amendments of like nature, reflecting the revisions made in the independent claims, were effected in a number of the dependent claims thereof, as deemed appropriate. With regard to independent claim 40, an editorial revision was implemented therein that is, basically, of a grammatical nature. The expression "said derivative value" in the penultimate line thereof was revised to the expression "derivative values" in order to conform to the plural nature of the expression to which it refers, i.e., the expression "deriving first and second values for the derivative..." in the claims. Regarding claim 16, the revision implemented therein is strictly of a minor formal nature, consistent with that effected in other ones of the dependent claims. It is noted, with regard to claim 16, that the plural form of the term "value" is employed, consistent with the set forth expression to which it refers. Such plural form of the term "value" which relates to derivative values of the envelope of the path transfer function, is now contained in all of the independent claims, consistent with the example related embodiments of the present application. Incidentally, with regard to independent claim 26, the expression "...of the path transfer function envelope of the radio signal" was

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amended to the expression "...of the envelope of the path transfer function for a radio signal," so as to be consistent with similar such expressions contained in other independent claims. The above noted changes, it is submitted, generally relate to minor editorial revisions that are of a formatting nature to better relate the same to the disclosed example embodiments. Therefore, acceptance/formal entry of the same is respectfully requested.

Applicants note with appreciation the indication that claims 6, 7, 13-15, 17-25, 31, 32, 38, 39 and 41-49 are directed to allowable subject matter and that these claims would be formally allowed upon being re-presented in an appropriate self-contained format. As will be shown herein below, however, the invention covered by the currently rejected claims could not have been achievable in a manner alleged in the outstanding art rejections. Applicants therefore consider that the re-presenting of the objected to claims in an appropriate independent claim format is deemed unnecessary.

Presently, claims 1-3, 8-10, 26-28 and 33-35 stand rejected under 35 U.S.C. §103(a), allegedly, as being unpatentable over Lu et al. (US 6,449,489) in view of Winters et al. (US 6,505,053), both of which are of record, and further in view of the "admitted prior art (page 1, lines 7-23)"; and claims 4, 5, 11, 12, 16, 29, 30, 36, 37 and 40 also stand rejected under 35 U.S.C. §103(a), allegedly, as being unpatentable over the same combination of Lu, Winters and the "admitted prior art as applied to claim 1," and further in view of Mallette et al. (US 6,636,574), also of record. It will be shown below, the invention according to these claims could not have been rendered obvious in the manner alleged in these rejections. Therefore, insofar as presently applicable, these rejections are traversed and reconsideration and withdrawal of the same is respectfully requested.

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The present invention is concerned with estimating Doppler spread and, also, estimating mobile station speed from Doppler spread. According to claim 1, for example, the invention calls for a method for computing an estimate of the Doppler spread of a radio signal being received from the derivative values of the envelope of the power transfer function for the radio signal. In accordance with independent claim 26, the claimed subject matter calls for computing an estimate of the Doppler spread of the radio signal from the derivative values of the path transfer function of the envelope of a radio signal, received by the receiver means of the mobile station. Independent claims 8, 16, 33 and 40, moreover, are directed to a method and a mobile station with regard to a wireless communication scheme in which the speed of the mobile station is estimated on the basis of the computed Doppler spread estimate.

An example of the method for estimating the Doppler spread as well as estimating mobile station speed on the basis of the estimated Doppler Spread is described, for example, in connection with the Figs. 3-4 of the drawings (see in particular steps s27-S31). The speed selection process such as detailed in the example flowchart shown in Fig. 5 of the drawings and described beginning on page 10, lines 27, of the specification, determines whether both the high and low estimate processes have produced reliable estimates (see for example claims 16+ and claims 40+). Further details regarding deriving of the derivative value of the path transfer function envelope pertaining to the radio signal as well as with regard to the computing of the Doppler Spread estimate are featured in various ones of the dependent claims. It is submitted, the invention defined in each of the independent claims 1, 8, 16, 26, 33 and 40 and further according to the corresponding dependent claims thereof is it clear patentable improvement over that previously known

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including over the combined teachings of the art documents as applied in the outstanding rejections.

Although Lu et al. discloses receiving of the radio signal and calculating a Doppler shift, Lu et al's scheme, it is submitted, is not related thereto. In fact, Lu et al. is concerned with compensating for the effects of fading and provides an algorithm for determining a power increment for such purpose. Although the algorithm does use a Doppler shift estimation, the focus of Lu et al's scheme is not directed to the provision of estimating Doppler shift. Lu et al. does not predict fading at discrete points in time. Lu et al. merely derives a power level at which to transmit a probe signal. The probe signal is transmitted at increasing power levels until a response is received (see column 2, line 55, to column 3, line 10; and column 9, lines 2-13, and steps 8, 10 and 12 of Fig. 8). The power level of a transmitted probe signal, in Lu et al, takes account of the speed since such can be assumed to be indicative of the fading that is likely to be experienced. According to Lu et al., the relative speed of the user equipment with respect to the system equipment (e.g., base station) "provides an indication of the type fading" (low correlation, high correlation) experienced by the pilot signal. Based on this indication of the type fading, the power of a probe signal to be transmitted is adjusted accordingly thus compensating for the fading that the probe signal is likely to experience." (Column 6, lines 7-12, in Lu et al.)

Winters et al. discloses deriving a result after the complex envelope of the received signal passes through the filtering process. However, the result that is derived once the signal is low-pass filtered is a signal with an improved fading power-to-noise ratio (FNR) (see column 4, lines 39-43). The low-pass filtered signal is then used to calculate a sinusoidal model for the fading process. Such, it is submitted, is not the same as the set forth featured aspect calling for "deriving

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values for the derivative of the envelope of the path transfer function for said radio

signal" (see independent claims 1, 8, 26 and 33 and, also, independent claims 16

and 40 in which a related expression reads as "deriving first and second values").

The following discussion explains this further.

The _derivative_ of a function, according to the compact Oxford English

Dictionary (see attachment A), can be defined as "an expression representing a rate

of change of a function with respect to an independent variable". Therefore, since

the envelope of the path transfer function is time dependent, it will be clearly

understood by one of ordinary skill that the derivative of the envelope of the path

transfer function is the rate of change of the amplitude of the envelope with respect

to time. In a disclosed embodiment, the envelope is first low-pass filtered such as

by implementing a third order Butterworth IIR Filter such as described on page 7,

lines 22-23, of the specification. An approximation is made to find the rate of

change of the magnitude of the envelope with respect to time, which involves taking

the difference between two time-spaced samples of the envelope magnitude. This

difference is then divided by the sampling interval. (Page 8, lines 2-21, of the

specification.) With regard to the example disclosed embodiments, this calculation

is carried out using, for example, a two-tap or three-tap FIR filter. This result is a

derivative value. Claim 1 as well as the other independent claims require the

deriving of plural such values, which are referred to in the claims as "derivative

values."

Turning to Winters et al., there is no disclosure or suggestion therein of

calculating the derivative of the envelope of the path transfer function as that called

for in each of the independent claims. In accordance with Winters et al's teachings,

once the received signal is low-path filtered, a root-MUSIC frequency estimation

model for the fading process is obtained. This does not involve passing the receipt

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signal through a further FIR filter or, for that matter, applying any other transformation that could result in a value for the derivative of the envelope of the path transfer function. It is stated in the first rejection, under Item 2 of the detailed action, that "Winters discloses deriving a result after the complex envelope of the received signal passes through the filtering process...". Such, it is submitted, does not constitute the claimed "deriving values for the derivative of the envelope...," according to independent claims 1, 8, 16, 26, 33 and 40 (in claims 16 and 40 the related recitation is somewhat differently presented). It is also stated, in the rejection, that "it would have been obvious...to provide the technique of Winters (deriving a result after the complex envelope of the received signal passes through the filtering process) to the system of Lu (et al.)...to provide an improved performance...by improving the ability of the system to correct for fading behavior." Such assertion, it is submitted, is refuted for reasons which follow.

Winters et al. employs an envelope signal to strictly predict fading at discrete points in time. Specifically, in connection with Figs. 1-4, Winters et al. teaches a method in which a radio signal is stripped of carrier and modulation to provide a signal to provide comprising just fading data and noise, which is then filtered (see column 8, lines 16-19). The filter used by Winters et al. is schemed based on an estimated maximum Doppler frequency (see step 305 in Fig. 3). However, the sole purpose of this is to predict fading at discrete points in time so that a signal can be adjusted and be outputted with the fading distortion removed. (Column 8, lines 63-66; and column 9, lines 1-3, in Winters et al.) Winters et al., it is submitted, does not estimate Doppler shift nor Doppler spread. Although fading is a result of a moving receiver being subjected to the Doppler effect, Winters et al does not, it is submitted, implicitly or explicitly use any estimation of Doppler spread or even Doppler shift.

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As discussed above, Lu does not predict fading discrete points in time,
rather, Lu et al, merely derive a power level at which to transmit a probe signal. For
Lu et al to include any fading prediction, the algorithm by which the power level is
calculated will need to include a time element. Such, however, is not the case
therein. It could therefore be said that Lu et al does not, either explicitly or implicitly,
rely on a prediction in fading at discrete points in time. The Doppler shift according
to Lu et al provides an indication in the type of fading (see column 6, lines 4-12) and
not a prediction of the fading at discrete points in time. The probe signal having the
calculated power level is transmitted sometime after the pilot signal is received. The
time between successive probe signal transmissions is defined, according to Lu et
al., as including a random element, i.e., time is not fixed. Therefore, in order for
fading prediction to occur, according to Lu et al., the algorithm by which the power
level is calculated will need to include a time element. Such, it is submitted, is not
the case in Lu. It can therefore be said, that one of ordinary skill would not have
considered applying the algorithm of Winters et al. that uses the envelope signal to
predict fading to the system of Lu et al for at least the reason that, in Lu et al, fading
is not predicted at discrete points and time, and, therefore, an algorithm according to
Winters et al. could not have been practically applied to Lu et al's scheme.

In the rejections, it is argued that it would have been obvious to apply the
technique of the "admitted prior art", in which, presumably, the Examiner is referring
to estimating Doppler spread which has been found to be useful for enhancing the
operation of receivers, to the modified system of Lu et al. and Winters et al. Such is
refuted for at least the following reasons.

It is submitted neither Winters et al. or Lu et al, either separately or in
combination, would have led to "computing an estimate of the Doppler spread of
said radio signal," which is featured in independent claims 1, 8, 26 and 33 or, for

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that matter, with regard to similar such featured aspects recited in independent

claims 16 and 40. It is true, as is asserted in the rejection, that Doppler spread

results from Doppler shifts. The cited "admitted prior art" of the specification

provides an explanation of how the Doppler spread is created from a plurality of

Doppler shifts in a single signal. However, in actual practice, it cannot be said that

knowing how a Doppler spread is generated makes it obvious how to calculate the

Doppler spread if a Doppler shift is known. Winters et al. does not calculate Doppler

shift and, moreover, Lu et al. calculates only one Doppler shift since this is all that is

needed to determine the type of fading occurring. It is evident, therefore, that

neither Lu et al. nor Winters et al. could be employed to determine the range of

Doppler shifts from which the Doppler spread could be calculated. Accordingly, the

combined teachings of Lu et al, Winters et al and the "admitted prior art" could not

have led to achieving the present invention.

Although Lu et al alleges that the Doppler shift can be calculated in any way,

measuring the Doppler shift to any degree of accuracy using only a single reference

signal, it is submitted, is not possible without a known frequency source such as an

atomic clock. The Doppler shift is the difference between the received frequency

and the transmitted frequency. Without a reference source, the absolute frequency

of the receipt signal cannot be determined. Without this information, a comparison

with the transmitted frequency to calculate a Doppler shift cannot be made. As one

of ordinary skill would know, UEs in CDMA systems typically are provided with

inexpensive, low quality crystal oscillators. This is acceptable since the oscillator

can be synchronized through base station transmissions, thereby providing a source

having the appropriate frequency at the UE. However, since the frequency of the

oscillator is with regard to the base station transmissions, it is intrinsic that the

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Doppler shift, resulting from relative movement of the base station and the UE, cannot be calculated. In other words, there seems to be an enabling concern in this regard of Lu et al's disclosure.

In Winters et al., also, the modelling calculations do not result in the measure of the Doppler shift or Doppler spread of the received signal. The fading process is modeled as a summation of sinusoids, each with a frequency equal to a Doppler shift f_i (see column 3, lines 38-49). However, these Doppler shifts f_i do not represent the actual Doppler shifts of the received signal; they are simply parameters in the model (see column 4, lines 9-10). At no point in the calculation, according to Winters et al., is the Doppler spread or the Doppler shifts of this signal explicitly calculated using the derivative of this envelope signal or otherwise. A maximum Doppler shift is estimated for all the signals of a given carrier frequency by assuming that the maximum speed of a mobile station is 60mph (see column 3, lines 49-55). Thus, the maximum Doppler shift does not represent the actual Doppler shift of the received signal.

For at least the above reasons, the invention according to independent claims 1 and 26 and also according to the corresponding dependent claims thereof could not have been realizable over the combined teachings of Lu et al., Winters et al. and the "admitted prior art", as applied in the rejection. Likewise, independent claims 8 and 33 and the corresponding dependent claims thereof are also considered patentable over the same applied art for the same and similar reasons therefor and, further, for the additional reasons that neither Lu et al. or Winters et al. taught estimating the speed of the mobile station using a Doppler spread estimate.

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With regards to independent claims 16 and 40, Mallette was additionally recited in combination with Lu et al., Winters et al. and the "admitted prior art". Mallette et al. does not disclose or suggest, it is submitted, "deriving first and second values for the derivative of the envelope of said radio signal." Instead, first and second values of the autocorrelation or autocovariance functions are referred to in Mallette et al. (Column 2, lines 55-65 in Mallette et al.). Moreover, Mallette et al. also do not disclose or suggest "first and second estimates of the Doppler spread of said radio signal.". Instead, first and second ratios are calculated and these ratios are then used to calculate a single estimate of the Doppler spread. This is discussed in column 3, lines 46-54, in Mallette et al.

In view of the above-noted differences and emphasis of the applied art, it is not seen how one of ordinary skill could have reasonably expected the combined teachings thereof would have led to achieving the present invention. For at least the above reasons, therefore, the invention according to claims 1-49 could not have been realizable based on that alleged in the outstanding rejections.

Therefore, in view of the amendments presented herein above, together with these accompanying remarks, reconsideration and withdrawal of the outstanding rejections as well as favorable action on the currently pending claims and an early formal Notification of Allowability of the above-identified application is respectfully requested.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned representative at the number indicated below.
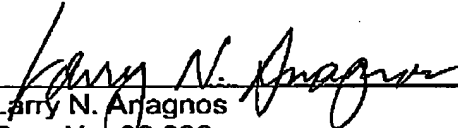
To the extent necessary, applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage in the fees due in connection with the

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Respectfully submitted,
ANTONELLI, TERRY, STOUT & KRAUS, LLP

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